

RECEIVED
CENTRAL FAX CENTER

SEP 22 2006

REMARKS

Applicant respectfully requests reconsideration and allowance of the subject application. Claims 1-16 and 20-23 are pending in this application.

Double Patenting

Claims 1, 3, 4, 11, 13, 15, and 16 stand rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3, 4, and 6 of U.S. Patent No. 6,647,514. Applicant notes the rejection of claims 1, 3, 4, 11, 13, 15, and 16 on the ground of nonstatutory obviousness-type double patenting over claims 1, 3, 4, and 6 of U.S. Patent No. 6,647,514. Applicant will submit a terminal disclaimer to overcome the double patenting rejection if this double patenting rejection is maintained at such time as the present application is allowed over the art of record.

35 U.S.C. § 102

Claims 15-20 and 23 stand rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 5,680,539 to Jones (hereinafter "Jones"). Claims 17-19 have been canceled without prejudice, thereby rendering the rejection of claims 17-19 moot. Applicant respectfully submits that claims 15, 16, 20, and 23 are not anticipated by Jones.

Jones is directed to a disk controller and method which performs data reconstruction on a drive in a disk array system using dynamic load balancing techniques to maintain a predictable level of degradation (see, col. 1, lines 10-13). As discussed in the Abstract of Jones, during non-idle periods, a rebuild task

monitors the current host command queue depth generated by the host and submits additional rebuild requests accordingly. Rebuild requests are preferably sized based on the current rebuild queue depth and the user-selected performance allotment for rebuild operations to maintain a predictable level of performance degradation. Therefore, the rebuild task dynamically compensates for host command queue depth by queueing an appropriate number of rebuild requests of varying size so that neither requesting task dominates.

With respect to claim 15, claim 15 has been amended to incorporate dependent claims 17 and 19, and recites:

An apparatus comprising:
a priority identifier to determine whether host input/output (I/O) requests or rebuild I/O requests for a storage array are to have priority;
a request dispatcher, communicatively coupled to the priority identifier, to select host I/O requests and rebuild I/O requests for execution based at least in part on whether host I/O requests or rebuild I/O requests are to have priority;
a request queue structure into which the rebuild I/O requests and the host I/O requests are placed to await selection for execution by the request dispatcher; and
a queue controller, communicatively coupled to the request queue structure, configured to order requests in the queue structure so that host I/O requests are higher than rebuild requests only if host I/O requests are to have priority.

Applicant respectfully submits that Jones does not disclose an apparatus as recited in amended claim 15.

In the June 7, 2006 Office Action at pp. 4-5, it was asserted that, regarding claim 19, Jones discloses a queue controller at column 4, lines 30-35. However, this cited portion of Jones is in the Summary of the Invention section, and recites:

During non-idle periods, a Host Queue Depth Monitor executing in conjunction with the Rebuild Task monitors the current host command queue depth generated by the host and increases or decreases a Desired Rebuild Queue Depth variable accordingly.

As discussed further in Jones, the Rebuild Task monitors the host command queue depth, and maintains a similar number of rebuild requests in the execution queue (see, col. 7, lines 44-48). The Rebuild Task dynamically compensates for the host command queue depth during the rebuild process so that neither rebuild requests nor host command requests dominate (see, col. 7, lines 48-56). The Rebuild Task includes a Host Queue Depth Monitor which monitors the number of host requests in the execution queue (see, col. 7, lines 63-66). When the Host Queue Depth Monitor is invoked, the Host Queue Depth Monitor determines whether the host queue depth is increasing (see, col.8, lines 2-5). If the host queue depth is increasing, then the Host Queue Depth Monitor increases a Desired Rebuild Queue Depth variable, and if the host queue depth is decreasing, then the Host Queue Depth Monitor decreases the Desired Rebuild Queue Depth variable (see, col. 8, lines 5-16).

Thus, it can be seen that Jones discusses the Rebuild Task and the Host Queue Depth Monitor as operating to adjust queue depths and maintaining a similar number of host command requests and rebuild requests in the execution queue. Jones simply mentions placing requests in the execution queue but makes no mention of any ordering of request in the execution queue. Thus, even though Jones mentions placing requests in the execution queue, there is no discussion or mention in Jones of ordering requests in the execution queue so that host command requests are higher than rebuild requests. Without any such discussion or mention, Applicant respectfully submits that Jones cannot disclose a queue

controller, communicatively coupled to the request queue structure, configured to order requests in the queue structure so that host I/O requests are higher than rebuild requests only if host I/O requests are to have priority as recited in amended claim 15.

For at least these reasons, Applicant respectfully submits that amended claim 15 is allowable over Jones.

With respect to claims 16, 20 and 23, given that claims 16, 20 and 23 depend from amended claim 15, Applicant respectfully submits that claims 16, 20 and 23 are likewise allowable over Jones for at least the reasons discussed above with respect to amended claim 15.

Claims 15 and 21 stand rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 5,822,584 to Thompson et al. (hereinafter "Thompson"). Applicant respectfully submits that claims 15 and 21 are not anticipated by Thompson.

Thompson is directed to a more efficient method for recovering data stored on a drive in a mass storage disk drive array subsystem for a personal computer system (see, col. 1, lines 6-10). As discussed in the Abstract of Thompson, the method calls for a microprocessor to check a stripe for consistency. If the stripe is inconsistent, the microprocessor rebuilds a predetermined number of stripes. If the checked stripe is consistent, then the microprocessor checks a next stripe and repeats the above-described process. Because the drive array subsystem receives both system requests and rebuild requests, Thompson allows a user to select the drive array subsystem's priority in processing system requests versus rebuild

requests, thereby allowing greater system access to the drive array subsystem during peak times of system requests.

With respect to amended claim 15, amended claim 15 has been amended to incorporate dependent claims 17 and 19, and recites:

An apparatus comprising:
a priority identifier to determine whether host input/output (I/O) requests or rebuild I/O requests for a storage array are to have priority;
a request dispatcher, communicatively coupled to the priority identifier, to select host I/O requests and rebuild I/O requests for execution based at least in part on whether host I/O requests or rebuild I/O requests are to have priority;
a request queue structure into which the rebuild I/O requests and the host I/O requests are placed to await selection for execution by the request dispatcher; and
a queue controller, communicatively coupled to the request queue structure, configured to order requests in the queue structure so that host I/O requests are higher than rebuild requests only if host I/O requests are to have priority.

Applicant respectfully submits that Thompson is not cited as disclosing, and does not disclose, an apparatus including a request queue structure and a queue controller as recited in amended claim 15. For at least these reasons, Applicant respectfully submits that amended claim 15 is allowable over Thompson.

With respect to claim 21, given that claim 21 depends from amended claim 15, Applicant respectfully submits that claim 21 is likewise allowable over Thompson for at least the reasons discussed above with respect to amended claim 15.

Applicant respectfully requests that the §102 rejections be withdrawn.

35 U.S.C. § 103

Claims 1-4 and 6-14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,835,700 to Carbonneau et al. (hereinafter "Carbonneau") in view of Jones. Applicant respectfully submits that claims 1-4 and 6-14 are not obvious over Carbonneau in view of Jones.

Carbonneau is directed to a RAID system that connects to a host computer by way of a SCSI interface and a diagnostics/control module that also connects to the SCSI interface (see, col. 1, lines 12-15). As discussed in the Abstract of Carbonneau, an intelligent status monitoring, reporting and control module is coupled to a SCSI bus that interconnects a cluster of SCSI-compatible data storage modules (e.g., magnetic disk drives). The status monitoring, reporting and control module is otherwise coupled to the cluster of SCSI-compatible data storage modules and to power maintenance and/or other maintenance subsystems of the cluster for monitoring and controlling states of the data storage modules and power maintenance and/or other maintenance subsystems that are not readily monitored or controlled directly by way of the SCSI bus. The status monitoring, reporting and control module sends status reports to a local or remote system supervisor and executes control commands supplied by the local or remote system supervisor. The status reports include reports about system temperature and power conditions. The executable commands include commands for regulating system temperature and power conditions.

As discussed at MPEP §§ 2142 and 2143, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge

generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicant respectfully submits that Jones and Carbonneau teach away from each other, and thus that there is no suggestion or motivation to combine Jones and Carbonneau, and thus that no *prima facie* case of obviousness has been established. Carbonneau states that "it is desirable to bring the failed drive back into an operational mode as soon as possible in order to minimize the danger of permanent data loss" (see, col. 17, lines 35-38). Jones, however, discloses having neither host command requests nor rebuild requests dominate (see, col. 7, lines 44-53). As rebuild requests do not dominate in Jones, but letting rebuild requests dominate would bring a failed drive back into an operational mode as soon as possible, Jones is teaching away from bringing the failed drive back into an operational mode as soon as possible. As Jones teaches away from Carbonneau, Applicant respectfully submits that there is no suggestion or motivation to combine Jones and Carbonneau, and that no *prima facie* case of obviousness has been established.

Furthermore, claim 1 recites:

A method comprising:
identifying that a storage array is close to permanently losing
data; and

giving, in response to identifying that the storage array is close to permanently losing data, input/output (I/O) requests for rebuilding at least a portion of the storage array priority over host I/O requests.

Assuming for the sake of argument that Jones and Carbonneau were combined, Applicant respectfully submits that the combination does not disclose or suggest the identifying and giving of claim 1.

In the June 7, 2006 Office Action at p. 7, it is acknowledged that Carbonneau does not disclose giving, in response to identifying that the storage array is close to permanently losing data, input/output (I/O) requests for rebuilding at least a portion of the storage array priority over host I/O requests, but Jones is relied on as disclosing this element of claim 1. However, Jones at col. 7, lines 44-56 discloses that (emphasis added):

According to the present invention, the Rebuild Task monitors the host command queue depth, i.e., the number of host command requests in the execution queue, and maintains a similar number of rebuild requests in the execution queue. Thus, the Rebuild Task dynamically compensates for the host command queue depth during the rebuild process. When the host has issued and queued a small number of requests, the Rebuild Task issues a correspondingly small number of rebuild requests, so that **neither requesting task dominates**. When the host has issued a heavy load of requests, the Rebuild Task queues a similarly large number of rebuild requests of varying size, again so that **neither requesting task dominates**.

Thus, it can be seen that Jones is directed to making sure that neither requesting task dominates. As such, Applicant respectfully submits that Jones does not give priority to either host command requests or rebuild requests – Jones is concerned with making sure that neither requesting task dominates, not giving priority to particular requesting tasks. Accordingly, Applicant respectfully submits that Jones does not disclose giving, in response to identifying that the storage array is

close to permanently losing data, input/output (I/O) requests for rebuilding at least a portion of the storage array priority over host I/O requests as recited in claim 1.

For at least these reasons, Applicant respectfully submits that claim 1 is allowable over Carbonneau in view of Jones.

With respect to claims 2-4 and 7-10, given that claims 2-4 and 7-10 depend from claim 1, Applicant respectfully submits that claims 2-4 and 7-10 are likewise allowable over Carbonneau in view of Jones for at least the reasons discussed above with respect to claim 1.

With respect to claim 6, claim 6 depends from claim 1 and Applicant respectfully submits that claim 6 is allowable over Carbonneau in view of Jones for at least the reasons discussed above with respect to claim 1. Furthermore, claim 6 recites:

A method as recited in claim 1, further comprising giving host I/O requests priority over rebuild I/O requests if the storage array is not close to permanently losing data.

Applicant respectfully submits that Carbonneau in view of Jones does not disclose or suggest any such giving as recited in claim 6.

Jones, as discussed above with respect to claim 1, is directed to making sure that neither host command requests nor rebuild requests dominate. As such, Applicant respectfully submits that Jones does not give priority to either host command requests or rebuild requests – Jones is concerned with making sure that neither requesting task dominates, not giving priority to particular requesting tasks. Accordingly, Applicant respectfully submits that Jones cannot disclose or suggest giving host I/O requests priority over rebuild I/O requests if the storage array is not close to permanently losing data as recited in claim 6.

Carbonneau is not cited as curing, and does not cure, these deficiencies of Jones. Accordingly, for at least these reasons, Applicant respectfully submits that claim 6 is allowable over Carbonneau in view of Jones.

With respect to claim 11, Applicant respectfully submits that, analogous to the discussion above regarding claim 1, Carbonneau in view of Jones does not disclose or suggest identifying that a storage array is close to permanently losing data, and giving, in response to identifying that the storage array is close to permanently losing data, input/output (I/O) requests for rebuilding at least a portion of the storage array priority over host I/O requests, as recited in claim 11. For at least these reasons, Applicant respectfully submits that claim 11 is allowable over Carbonneau in view of Jones.

With respect to claims 12-14, given that claims 12-14 depend from claim 11, Applicant respectfully submits that claims 12-14 are likewise allowable over Carbonneau in view of Jones for at least the reasons discussed above with respect to claim 11.

Claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Carbonneau and Jones and further in view of "RAID: High-Performance, Reliable Secondary Storage" to Chen et al. (hereinafter "Chen"). Applicant respectfully submits that claim 5 is not obvious over Carbonneau and Jones and further in view of Chen.

Claim 5 depends from claim 1, and Applicant respectfully submits that claim 5 is allowable over Carbonneau and Jones for at least the reasons discussed above with respect to claim 1. Chen is not cited as curing, and does not cure, the deficiencies of Carbonneau and Jones discussed above. Accordingly, for at least

these reasons, Applicant respectfully submits that claim 5 is allowable over Carbonneau and Jones and further in view Chen.

Claim 22 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Jones and Carbonneau. Applicant respectfully submits that claim 22 is not obvious over Jones in view of Carbonneau.

Claim 22 depends from amended claim 15, and Applicant respectfully submits that claim 22 is allowable over Jones for at least the reasons discussed above with respect to amended claim 15. Carbonneau is not cited as curing, and does not cure, the deficiencies of Jones discussed above with respect to amended claim 15. Additionally, Applicant respectfully submits that, similar to the discussion above regarding claim 1, Jones in view of Carbonneau does not disclose or suggest to determine that rebuild I/O requests are to have priority if failure of one additional storage device of a plurality of storage devices in the storage array would result in data loss in the storage array as recited in claim 22.

Accordingly, for at least these reasons, Applicant respectfully submits that claim 22 is allowable over Jones in view of Carbonneau.

Applicant respectfully requests that the §103 rejections be withdrawn.

RECEIVED
CENTRAL FAX CENTER
SEP 22 2006

Conclusion

Claims 1-16 and 20-23 are in condition for allowance. Applicant respectfully requests reconsideration and issuance of the subject application. Should any matter in this case remain unresolved, the undersigned attorney respectfully requests a telephone conference with the Examiner to resolve any such outstanding matter.

Respectfully Submitted,

Date: 9/22/06

By: [Signature]
Allan T. Sponseller
Reg. No. 38,318
(509) 324-9256